

REMARKS

Claims 1, 2 and 4-10 are the claims pending in the application. Applicants have incorporated claim 3 into claim 1, and thus have canceled claims 3 without prejudice or disclaimer. Applicants respectfully traverse the prior art rejection based on the following discussion.

I. The 35 U.S.C. Section 112, First and Second Paragraph Rejections

In response to the 35 U.S.C. Section 112, First and Second Paragraph Rejections, Applicants have amended claims 1 and 10 consistent with the Examiner's helpful comments as indicated above. Specifically, Applicants have amended claim 10 indicating that the final material, in an exemplary embodiment, is a gradient composite material. (See Application, Page 10, lines 20-22; and Page 12, lines 18-20).

In view of the foregoing, Applicant respectfully requests that the Examiner withdraw the rejections.

II. Prior Art Rejections

Claims 1-10 are rejected under 35 U.S.C. Section 102(b) as being anticipated by Muller, et al. ("Muller")(U.S. Patent No. 4,608,210) and rejected under 35 U.S.C. Section 103(a) as being unpatentable over Muller. Claims 1-10 are rejected under 35 U.S.C. Section 102(b) as being anticipated by Piovoso, et al. ("Piovoso")(PCT WO 00/20190). Claims 1-10 are rejected under 35 U.S.C. Section 102(b) as being anticipated by Schneider, et al. ("Schneider")(U.S. Patent No. 3,906,065)

A. The Rejection Based on Muller

Regarding claims 1-10, Muller fails to disclose, teach or suggest the features of independent claim 1, including employing multiple feed streams of raw ingredients at variable feed rates for compounding into a final material, and producing a final material including a compositional gradient in an architecture of the composite material where the final material is a gradient material formed by segmented elements of the screw extruder system. (See Application, Page 3, line 22-Page 4, line 5; Page 5, line 16-Page 6, line 3; Page 7, lines 4-6; Page 9, lines 13-15; Page 10, line 4-Page 11, line 12; Page 12, line 20-Page 13, line 8; Page 14, lines 4-18; Page 15, lines 3-16; and Figures 1 and 2).

Indeed, Figures 1-4 of Muller merely teach a conventional method for producing plastically bonded propulsion powders and explosives with a simultaneous reduction of the plastic binder component where the final mixture ratio of the explosive/propulsive powder and plastic binder are held constant so that the final product has a uniform composition without compositional gradients. In particular, the process includes adding plastic binder from a storage container 11 through an inlet opening 9 while the screw shafts 5 reciprocate. Afterwards, a feed device 14 is operated to conduct the crystalline explosive material from the storage container 12 through the channel 10 into the inlet opening 9 where the revolutions of the feeding device 12 are steadily increased. Simultaneously, the revolutions of a feeding device 13 are decreased in order to produce the desired mixture ratio. More particularly, this process provides disturbances with a series of steps in one direction, that is, is a one way process with steadily increasing solids input, until the mixture ratio is held constant. Contrary to the assertion in the Office Action, the final material is a uniform composition without a

gradient as the final uniform composition occurs when the mixture ratio of the explosive powder to plastic binder is held constant. Importantly, the steadily increasing ratio produces “scrap” intermediate material where the gradient is constantly changing until the final ratio is determined. Consequently, the resultant material is produced with a constant, uniform composition throughout the resultant material unlike Applicant’s claimed invention, which includes a final material composed of a compositional gradient, that is, a non-uniform compositional gradient, formed by segmented elements of the screw extruder system. Accordingly, Muller’s process and related structure of the invention is consistent with the function of the invention as the final resultant explosive material is a material with a uniform composition without a gradient unlike Applicant’s claimed invention. Thus, Muller only teaches or suggest a final material with a uniform composition based on a specific mixture ratio without any gradient like Applicant’s invention.

Please note, the Office Action provides for a changing gradient in the composition until the final mixture ratio is determined without expressly or implicitly providing for such a recitation of a final gradient in the final composition in the Muller reference. This ramping (what the Office Action attempts to analogize to Applicant’s introducing disturbances) is performed for safety reasons unlike Applicant’s invention, which uses the disturbances to produce a compositional gradient in the final material as discussed below, and previously discussed in the Amendment of March 17, 2008. (See Office Action, Page 3, Section 9, and Page 4, Section 16; Muller at Abstract; Column 1, lines 5-40; Column 3, line 17- Column 4, line 42; and Figures 1-4).

In contrast, as discussed above, Applicant discloses a process for making a gradient material where multiple feed streams of different materials are compounded and fed, at variable rates, through a twin screw extruder for producing a final material where the final material includes a compositional gradient. Based on this process, and for emphasis, the final material extruded through a die 108 includes a compositional gradient in an architecture of the composite material, which was produced as a result of compounding through segmented elements of the twin screw extruder system 100. Accordingly, the final material is a gradient material as it includes a non-uniform compositional gradient formed by the screw extruder 100, and related system.

Importantly, the process includes multiple feed streams of raw ingredients fed at variable rates for compounding into the final material where the final material is a composite material. By using multiple feed streams of different raw ingredients fed at variable rates, a gradient propellant material with different characteristics can ultimately be formed to enhance performance of the propellant. In contrast, Muller's process suggests that the feed streams and the resultant ingredients are set once the desired mixing ratio is obtained. (See Application, above).

Finally, and for emphasis, Applicant discloses that the process includes employing multiple feed streams of raw ingredients at variable feed rates for compounding into a final material and producing a resultant final material, such as a final propellant material, with a compositional gradient in an architecture of the final material formed by segmented elements of the screw extruder system. In contrast, Muller only discloses a process for producing propulsion powders and explosives with a uniform composition at the final mixture ratio, let alone, the final material including a

compositional gradient section. An attempt to substitute Muller's process, which includes constantly increasing solids input until reaching the desired final mixture ratio, would not be a compatible process with Applicant's process. Indeed, Applicant's process includes employing multiple feed streams of raw ingredients at variable feed rates for compounding and applying disturbances to at least one of the feed streams without any final mixture ratio, and thus an attempted substitution would likely fail. To be sure, the conventional Muller technology produces a final material with a uniform composition but without any compositional gradient, and would not produce a final material with a compositional ingredient, that is, a non-uniform compositional gradient, particularly as a gradient of different materials cannot be established at a constant mixture ratio.

Therefore, Applicant's invention is a distinct structure compared to the conventional Muller invention. Thus, and using the most recent and more relaxed interpretation of obviousness under KSR v. Teleflex, No. 04-1350, 550 U.S. __ (April 30, 2007), Muller does not disclose, teach or suggest the features of independent claim 1, including employing multiple feed streams of raw ingredients at variable feed rates for compounding into a final material, and producing a final material including a compositional gradient in an architecture of the composite material where the final material is a gradient material formed by segmented elements of the screw extruder system. (See above).

Based on the above, the Applicant traverses the assertion that Muller discloses or teaches Applicant's invention of independent claim 1, and related dependent claims 2 and 4-10.

B. The Rejection Based on Piovoso

Regarding claims 1-10, Piovoso fails to disclose, teach or suggest the features of independent claim 1, including introducing disturbances into at least one of the feed streams by altering at least one of the material rate input conditions and the operating conditions, in conjunction with a predetermined hardware element configuration of the hardware element configurations where the disturbances are selected from at least one of the group of step disturbances, linear ramp disturbances, and non-linear ramp disturbances to form the compositional gradient. (See Application, Page 3, line 22-Page 4, line 5; Page 5, line 16-Page 6, line 3; Page 7, lines 4-6; Page 9, lines 13-15; Page 10, line 4-Page 11, line 20; Page 12, line 20-Page 13, line 8; Page 14, lines 4-18; Page 15, lines 3-16; and Figures 1 and 2).

Indeed, Figures 1 and 2 of Piovoso merely teach a method for control of an extrusion process by applying dynamic periodic pulses to the process and analyzing feedback results to adjust process parameters and production properties. More particularly, this process discloses or suggests a pulsing test system for control decisions in order to adjust process parameters and anticipate drift during production not define a process for producing a final material, let alone, with a compositional gradient, like Applicant's invention. In particular, the Piovoso process includes adding, on a regular, repeated basis, a pulse mass of pre-weighted material 1 to an extrusion process running at normal, steady state operating conditions. The material is added to perturb the steady-state operation via a mass or chemical disturbance as the pulse mass 1 is added at a point where the feeds enter the extruder 3. This periodic pulse technique monitors feed transport, melting, mixing, pumping and chemical reactions of a twin-screw extruder

production process where signals generated during production are sent and connected to a data acquisition system signal conditioning front end hardware 7. A pulse analysis and control computer 10 control the pulse test cycle, performs signal processing 12 to analyze the pulse response 11 input from the data acquisition hardware 9, calculates a control decision 13 and outputs the control setpoints 14 to the data acquisition hardware 9 or the extrusion process operator. Importantly, a control algorithm calculates new control setpoints 14 based on the pulse response 11 so that setpoint signals 15 and the human operator may manipulate the process to maintain product quality. Accordingly, this periodic pulse extrusion control process perturbs the process intentionally “each and every time a product property measurement is required.” Contrary to the assertion in the Office Action, the control setpoints computed from the pulse response model adjust for changes in ingredients and the extrusion process over time scales determined by the pulse test cycle interval not introduce pulse disturbances, for example, into the material input, in the process of forming an actual final material with a compositional gradient like Applicant’s invention. To be sure, Piovoso indicates that the dynamic response of the pulse is more immune to changes that affect traditional sensor measurements, such as melt temperature and pressure, as a suggested basis for this pulse test. Thus, Piovoso only teaches or suggests a pulse test process using periodic pulse disturbances to perturb an extrusion process not introduce non-pulse disturbances to alter at least one of the material rate input conditions and the operating conditions to form a final material with a gradient section like Applicant’s invention. (See Office Action, Pages 3-4, Section 10; Piovoso at Abstract; Page 1, lines 4-7 and lines 32-37; Page 2, lines 1-10; Page 2, line 24-

Page 4, line 30; Page 5, lines 11-16; Page 6, line 29-Page 7, line 10; Page 8, lines 20-27; and Figures 1 and 2).

In contrast, as discussed above, Applicant discloses a process for making a gradient material where multiple feed streams of different materials are compounded and fed at variable rates through a twin screw extruder for producing a final material where the final material includes at least a segment having a compositional gradient. Based on this process, and for emphasis, a user introduces non-pulse disturbances into at least one of the feed streams of a feeder 106 in order to alter at least one of the material rate input conditions and operating conditions at a predetermined hardware element configuration in order to form the final material. As indicated, the final material extruded through a die 108 includes at least a segment having a compositional gradient, that is, a non-uniform compositional gradient, in an architecture of the composite material.

Importantly, Applicant submits that single step disturbances, series of step disturbances, continuous linear ramp disturbances or nonlinear ramp disturbances are the desired disturbances associated with material input conditions or operating conditions to form the compositional gradient not pulse disturbances as disclosed by Piovoso. By using multiple feed streams of different raw ingredients fed at variable rates in conjunction with the above types of introduced non-pulse disturbances, a gradient propellant material with different characteristics can ultimately be formed to enhance performance of the propellant. In contrast, Piovoso's feedback pulse test process for instituting control decisions suggests using pulses, and seems to teach away from using other disturbances, such as, the disturbances identified above and used by Applicant

during manufacturing. (See Application, above, and Page 11, lines 17-20 with emphasis).

Finally, and for emphasis, Applicant discloses a production process for making a gradient material, including, in pertinent part, introducing non-pulse disturbances into at least one of the feed streams by altering at least one of the material rate input conditions and the operating conditions, in conjunction with a predetermined hardware element configuration in order to produce a final propellant material with a compositional gradient. In contrast, Piovoso only discloses a pulsing test system using pulse impulses for control decisions in order to adjust process parameters and anticipate drift during production not define a process for producing a final material, let alone, introducing non-pulse disturbances into at least one of the feed streams by altering at least one of the material rate input conditions and the operating conditions, let alone, produce a final material with a compositional gradient like Applicant's invention. An attempt to substitute Piovoso's pulse test system including using only pulse impulses for obtaining desired adjustment process parameters to control production would not be a compatible process with Applicant's process, which includes introducing non-pulse disturbances into at least one of the feed streams by altering at least one of the material rate input conditions and the operating conditions, to produce a final propellant material, and thus an attempted substitution would likely fail. To be sure, the Piovoso technology only uses pulse impulses as part of a feedback control system to anticipate and control drift during manufacturing but does not define a manufacturing process using non-pulse disturbances, and thus the Piovoso technology would not produce a final material with at least one section with a compositional ingredient.

Therefore, Applicant's invention is a distinct structure compared to the conventional Piovoso invention. Thus, and using the most recent and more relaxed interpretation of obviousness under KSR v. Teleflex, No. 04-1350, 550 U.S. ___ (April 30, 2007), Piovoso does not disclose, teach or suggest the features of independent claim 1, including introducing disturbances into at least one of the feed streams by altering at least one of the material rate input conditions and the operating conditions, in conjunction with a predetermined hardware element configuration of the hardware element configurations where the disturbances are selected from at least one of the group of step disturbances, linear ramp disturbances, and non-linear ramp disturbances to form the compositional gradient. (See above).

Based on the above, the Applicant traverses the assertion that Piovoso discloses or teaches Applicant's invention of independent claim 1, and related dependent claims 2-10.

C. The Rejection Based on Schneider

Regarding claims 1-10, Schneider to disclose, teach or suggest the features of independent claim 1, including employing multiple feed streams of raw ingredients at variable feed rates for compounding into a final material, and producing a final material including a compositional gradient in an architecture of the composite material where the final material is a gradient material formed by segmented elements of the screw extruder system. (See Application, above).

Indeed, Schneider merely teaches a conventional process for producing shaped, marbled thermoplastic products. In particular, the marbilizing process includes, in pertinent part, alternately introducing metered amounts of different colored thermoplastic sand-like agglomerates into a feed or inlet zone of an extruder, mixing the

thermoplastic materials in the extruder, and extruding the resulting marble mixture to form the desired marbled shaped thermoplastic product. Importantly, this process uses an alternately controlled metering device to introduce metered amounts of the different colored thermoplastic material before extrusion where the feed rates is adjusted to the discharge rate without the apparent introduction of disturbances, whereas Applicant teaches, in part, employing multiple feed streams of raw materials at variable feed rates for compounding into a final material where, as previously discussed, disturbances are introduced into at least one of the feed streams. Further, Schneider seems to suggest that the extruder is a single screw extruder, whereas, Applicant teaches that the screw extruder system is a twin-screw extruder system where the system includes segmented elements. Consequently, the resultant material produced by Schneider is a material arranged in a marbled fashion (what the Office Action attempts to analogize to a color gradient), which one of ordinary skill in the art and the average person would know that marble may have multiple colors but it certainly is not a gradient as the different colors appear randomly through the marble material. Therefore, the resultant material produced by the Schneider process is unlike Applicant's claimed invention, which includes producing a final material composed of a compositional gradient, that is, a non-uniform compositional gradient, formed by segmented elements of the screw extruder system. (See Office Action, Page 4, Section 12; Schneider at Abstract; Column 1, lines 5-40; Column 2, lines 9-64; and Column 3, lines 1-55).

Finally, and for emphasis, Applicant discloses that the process includes employing multiple feed streams of raw ingredients at variable feed rates for compounding into a final material and producing a resultant final material, such as a final

propellant material, with a compositional gradient in an architecture of the final material formed by segmented elements of the screw extruder system. In contrast, Schneider only discloses a process using metered amounts of material fed into a single screw extruder for producing marbled thermoplastic products without producing any compositional gradient section. An attempt to substitute Schneider's process, which includes feeding material without any variable feed rates into a single screw extruder would not be a compatible process with Applicant's process. Indeed, Applicant's process includes employing multiple feed streams of raw ingredients at variable feed rates for compounding and applying disturbances to at least one of the feed streams without any final mixture ratio, and thus an attempted substitution would likely fail. To be sure, the conventional Schneider technology only produces a marbilzed final material without producing any compositional gradient in the architecture of the final material.

Therefore, Applicant's invention is a distinct process, and related structural configuration, compared to the conventional Schneider invention. Thus, and using the most recent and more relaxed interpretation of obviousness under KSR v. Teleflex, No. 04-1350, 550 U.S. __ (April 30, 2007), Schneider does not disclose, teach or suggest the features of independent claim 1, including employing multiple feed streams of raw ingredients at variable feed rates for compounding into a final material, and producing a final material including a compositional gradient in an architecture of the composite material where the final material is a gradient material formed by segmented elements of the screw extruder system. (See above).

Based on the above, the Applicant traverses the assertion that Schneider discloses or teaches Applicant's invention of independent claim 1, and related dependent claims 2 and 4-10.

III. Formal Matters and Conclusions

In view of the foregoing, Applicants submit that claim 1, 2 and 4-10, all the claims presently pending in the application, is patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary.

Please charge any deficiencies and credit any overpayment to Attorney's Deposit Account Number 50-1114.

Respectfully submitted,

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